Heinemann

AQA Science Uncovered

Planning for your new teaching

Welcome to AQA Science Uncovered

Heinemann AQA Science Uncovered has been designed to match the new AQA suite of specifications: GCSE Science, GCSE Additional Science, GCSE Additional Applied Science, GCSE Biology, GCSE Chemistry, GCSE Physics. These new specifications emphasise **how science works** along with the **implications of science for society**.

Heinemann AQA Science Uncovered offers a comprehensive, fully integrated package to support AQA's specifications, incorporating **student books**, an **online package of interactive teaching activities and over 600 teacher resource sheets, student revision books** and an **online assessment** package. All components have been written by experienced authors, teachers and examiners and have been designed to make the delivery of the specification easy.

This document has been written to help you get started in your planning for teaching this new course - using the integrated components that Heinemann has produced. It covers the student books and the online resource and also provides a suggested scheme of work.

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The student books

The differentiated student books for core science (one for higher and one for foundation) have been designed to make learning science fun and to ensure that all students achieve their potential, whatever their ability. The books begin with a section on **How Science Works**, introducing many of the terms and concepts from section 10 in the specification. The section is set in the context of a local community alarmed at the number of fish dying in their river, which they believe is a result of a detergents factory discharging waste into the river, and how they, and the scientists working on behalf of the factory, disagree over the interpretation of the data collected.

The student books follow the layout of the **AQA specifications A and B**; which have **exactly the same content**, except that specification A has each of the three units B1, C1 and P1 divided into two (B1a, B1b, C1a, C1b, P1a, P1b). In the student book, each unit is divided into **sections** which also follow the divisions in the AQA specifications. Each section is then covered in between four to nine lessons or double page spreads.

Each section begins with an introductory spread which gives a brief overview of what is to be covered in the section and introduces the topics in an engaging way. These spreads link the science to be covered to everyday life examples and issues or stories students may have heard on the radio/tv or read in the newspapers, e.g. children not doing enough exercise, becoming obese, life style trainers, link between diet and health, and issues that the students should think about before they start the section.

The content pages incorporate **How Science Works** throughout, in particular focussing on data and evidence, gathering and interpretation. Each section ends with a double page spread focussing either on ideas, evidence or issues. Throughout each book there are clear explanations with diagrams and photos to help students understand the science or the issues being discussed.

In-text questions throughout the double page spreads help students to consolidate their knowledge and understanding as they go along. Many of these questions are about How Science Works, e.g. data evaluation and not just about the content just covered.

Suggested scheme of work

Term	*Biology*		*Chemistry*		*Physics*	
Year 10 Autumn	**B1a – Human biology**		**C1a – Products from rocks**		**P1a Energy and electricity**	
	Spread numbers and topics	***Lessons***	***Spread numbers and topics***	***Lessons***	***Spread numbers and topics***	***Lessons***
	Section 1 Body conditions and health - intro	1	***Section 1 Earth provides - intro***	1	***Section 1 Keeping warm - intro***	1
	1.1 Keeping a balance Maintaining water content, blood sugar levels, temperature ***See lesson plan on page 14***	2	**1.1 What are materials made of?** Atoms, chemical bonds, properties of elements and compounds ***See lesson plan on page 16***	2	**1.1 Moving thermal energy** Conduction in solids, convection in liquids and gases ***See lesson plan on page 18***	2
	1.2 Alarm systems Nervous system, reflex actions, synapses	3	**1.2 Limestone is very useful** Using limestone, reactions of limestone, chemical reactions	3	**1.2 Radiation** The Sun, absorbing and emitting	3
	1.3 Controlling pregnancy Menstrual cycle, birth control benefits and problems, fertility drugs	4	**1.3 New rocks from old** Making mortar, cement and concrete, making glass	4	**1.3 How fast can thermal energy be transferred?** Cooling and warming in nature and technology	4
	1.4 Evaluating the benefits Test tube babies, IVF	5	**1.4 The shock of the new** Building with concrete and glass	5	**1.4 Keeping heat in – or out** Insulation – cavity walls and vacuum flasks	5
	1.5 Healthy eating Changing lifestyles, balanced diet, metabolic rate	6	***Section 2 Useful materials - intro***	6	**1.5 Useful energy** Transforming and transferring energy. Wasted	6

					energy	
	1.6 Too much or too little Obesity, arthritis and diabetes in developed world, disease in developing world	7	**2.1 Getting at the metal** Metal ores, metal extraction	7	**1.6 Energy efficiency** What is efficiency? Calculating efficiency	7
	1.7 Keeping your heart healthy Heart disease, cholesterol levels, low and high density lipoproteins, saturated fats	8	**2.2 Extracting iron and making steel** Extracting iron, purifying cast iron, steel	8	**1.7 Reducing energy consumption** Effectiveness and cost-effectiveness, energy and transportation	8
	1.8 Slimming Evaluating claims about slimming products	9	**2.3 Properties and uses of alloys** Alloys, comparing steels, smart alloys	9	***Section 2 Making and using electricity - intro***	9
	Section 2 Drugs and disease - intro	10	**2.4 Mining metal** Copper: properties, mining and extracting	10	**2.1 Energy transformations** Why is electricity useful? Power stations, the National Grid, transformers, power	10
	2.1 What's in a drug Why do people use drugs, addiction to drugs and alcohol	11	**2.5 The lightweight champions** Aluminium and titanium: uses, extraction, properties, recycling metals	11	**2.2 Paying for electricity** kWh, calculating energy transferred, cost of electricity	11
	2.1 Smoking kills Addiction to nicotine, acceptance of the link between smoking and lung cancer	12	**2.6 Spaceship Earth** The Earth's resources, exploiting other poorer countries, recycling	12	**2.3 Fuels for generating electricity** Generators, fossils fuels, pollution, nuclear fission	12
Spring term	**2.3 Developing new drugs** Clinical trials, testing new drugs	13	***Section 3 Oil: black gold - intro***	13	**2.4 Generating electricity from renewables 1** Wind, tidal and hydroelectric power	13
	2.4 Establishing links Evaluating claims made about the	14	**3.1 The chain gang** Crude oil, hydrocarbons,	14	**2.5 Generating electricity from renewables 2**	14

	effect of cannabis on health		alkanes		Solar and geothermal power	
	2.5 Defence against disease Bacteria and viruses, pathogens, role of white blood cells in producing antibodies	15	**3.2 Separating oil** Fractional distillation	15	**2.6 Which energy source?** Building and running power stations, supplying electricity	15
	2.6 Treating and preventing disease Painkillers, antibiotics and resistance to them, penicillin	16	**3.3 Warm up or chill out with oil** Global warming, global dimming, acid rain	16		
	2.7 Protecting against disease Immunisation programmes, vaccines and possible side effects	17	**3.4 Is global warming really all our fault?** Global warming, sources of carbon dioxide, reducing carbon dioxide levels	17		
	2.8 Controlling infection MRSA, mutation and resistance of bacteria, pandemics	18	**3.5 And if we run out of oil?** Alternative fuels	18		
	B1b – Evolution and environment		**C1b - Oils, Earth and atmosphere**		**C1b Oils, Earth and atmosphere**	
	Section 3 Variation and evolution - intro	19	***Section 4 Oil is not just for energy! - intro***	19	***Section 3 Waves - intro***	16
	3.1 Winners and losers Competition for food, territory and mates (animals) and light, water and nutrients (plants)	20	**4.1 Get cracking** Cracking, alkenes, unsaturated hydrocarbons	20	**3.1 What are waves?** Frequency, wavelength, amplitude, EM spectrum	17
	3.2 Surviving in cold climates Adaptations for survival in cold places, insulation, behaviour and less surface area	21	**4.2 Alcohol from oil** Producing ethanol	21	**3.2 Telling waves apart** Wave speed, properties and uses of EM waves	18
	3.3 Surviving heat and attacks Adaptations for survival in hot places, defence mechanisms	22	**4.3 Molecular spaghetti** Monomers, polymers, polymerisation, smart polymers	22	**3.3 Energetic waves** Reflection, absorption, transmission	19

Summer term	**3.4 Collecting and analysing ecological data** Sampling distributions, effect of light, shade, temperature, water and ions on distribution	23	**4.4 The weird and the wonderful** Polymers: hydrogels, properties, future applications	23	**3.4 Communicating with waves** Radio waves, microwaves, digital and analogue signals	20
	3.5 Passing on information Genes and chromosomes, sexual and asexual reproduction	24	**4.5 Living in the plastic age** Disposing of plastics, recycling plastics	24	**3.5 Wave detectives** Visible light, UV waves, IR radiation, fibre optics	21
	3.6 High-tech breeding Producing new plants from cuttings, plant cloning, ethical issues	25	***Section 5 Plants and oil - intro***	25	**3.6 Healing or harming?** X-rays and Gamma rays	22
	3.7 Swapping genes Genetic engineering, manufacturing medicines using GM technology, GM crops	26	**5.1 Eating oil** Saturated and unsaturated fats in our diet, bromine test for unsaturated fats	26	**3.7 Risky business** Potential risks of mobile phones and power lines	23
	3.8 Social and ethical issues Ethical and social issues of genetic engineering	27	**5.2 Processed food** Hydrogenation of vegetable oils, food additives	27	***Section 4 Radioactivity - intro***	24
	3.9 Evidence about the past Ecological and evolutionary relationships, extinct species	28	**5.3 Things to do with white emulsion** Emulsions, emulsifiers	28	**4.1 What a life!** Radioactive decay, half-life, nuclear waste	25
	3.10 Forming new species Different theories of evolution, identifying patterns and relationships to make predictions	29	**5.4 Analysing food** Chromatography, reliability of results	29	**4.2 Inside the atom** Structure of the atom, isotopes, 3 types of radioactivity	26
	3.11 Challenging ideas How life began, similarities and differences between species	30	***Section 6 Earth and atmosphere - intro***	30	**4.3 It's all Greek to me** Alpha, beta or gamma. Radioactive dating	27
	Section 4 Taking care of the planet - intro	31	**6.1 Beneath your feet** Earth's crust, tectonic plates, creating mountains	31	**4.4 Dealing with radiation hazards** Gamma radiation, X-rays,	28

					radioactive waste	
	4.1 Human population growth Effect on raw materials**,** creation of waste and pollution	32	**6.2 Our restless planet** Earthquakes and volcanoes	32	***Section 5 Observing the Universe - intro***	29
	4.2 Air pollution Pollution by exhaust fumes, acid rain, lichen as indicators	33	**6.3 Predict and survive** Predicting earthquakes and volcanoes	33	**5.1 Look what's out there** Telescopes	30
	4.3 Global warming Greenhouse gases, increase in CO_2, loss of biodiversity	34	**6.4 The air that we breathe** Earth's atmosphere, noble gases	34	**5.2 The expanding Universe** Red-shift	31
	4.4 Sustainable development Using natural resources and energy, recycling	35	**6.5 Where did the atmosphere come from?** Early atmosphere to today's atmosphere	35	**5.3 What's happening to the Universe?** Big bang and steady state	32
	4.5 Global warming – fact or fiction? Collecting data and the evidence for environmental change, correlation	36	**6.6 Keeping the atmosphere in balance** Atmospheric carbon dioxide levels, climate change	36		
Year 11 Autumn term	***B2***		***C2***		***P2***	
	Section 1 Cells and photosynthesis – intro	1	***Section 1 Atoms build matter - intro***	1	***Section 1 Forces and motion - intro***	1
	1.1 Cells Structure and process of animal and plant cells	2	**1.1 Building blocks of matter** Atoms, molecules and elements. Proton number, atomic number, electron shells	2	**1.1 Distance-time graphs** Slope of a distance-time graph determines speed	2
	1.2 Specialised cells	3	**1.2 Electrons rule**	3	**1.2 Heading in the right**	3

	Function of plant and animal cells linked to structure		**chemistry** Electron levels, periodic table, making compounds		**direction** Velocity-time graphs, area under representing distance travelled	
	1.3 Getting in and out of cells Diffusion and osmosis	4	**1.3 Atomic bonding** Noble gases, ions, halogens, ionic bonding	4	**1.3 Acceleration** Calculating acceleration, slope of velocity-time graph	4
	1.4 Investigating photosynthesis Light, carbon dioxide and chlorophyll, producing oxygen	5	**1.4 Rules for ionic bonding** Properties of Ionic bonds	5	**1.4 Forces – balanced and unbalanced** Resultant forces, acceleration in direction of resultant force	5
	1.5 Limiting factors Rate of photosynthesis, limiting factors	6	**1.5 Molecules: atoms sharing electrons** Covalent bonds, covalent compounds	6	**1.5 Action and reaction** Weight, mass and gravitational strength	6
	1.6 After photosynthesis Carbohydrates, nitrates, deficiency	7	**1.6 Tightly bound but loosely linked** Intermolecular forces, macromolecules	7	**1.6 Top speed** Object moving through a fluid or the air, terminal velocity	7
	1.7 Life in the greenhouse Enhancing limiting factors, using nitrates	8	**1.7 A world of materials to choose from** Chemical bonds and properties of matter, smart materials	8	**1.7 Safe driving** Stopping, thinking and braking distances, effect of alcohol and tiredness and weather conditions	8
	1.8 Manipulating the environment of crop plants Enhancing carbon dioxide, increasing temperature, yield	9	**1.8 Technologies too small to see** Nanotechnology, nanoparticles and nanobots	9	***Section 2 Energy and motion – intro***	9
	Section 2 Energy in ecosystems – intro	10	***Section 2 The power of measurement - intro***	10	**2.1 Kinetic energy** Transformation into other forms of energy, elastic potential energy	10
	2.1 Ecological pyramids	11	**2.1 What makes up an**	11	**2.2 Forces doing work**	11

	Food chains, producers, pyramids of biomass		**atom's mass?** Atomic number, mass number, relative atomic mass, neutrons		Relationship between force, distance, work done and energy transferred	
	2.2 Energy flow Ecosystems, energy flow, energy loss	12	**2.2. Chemistry by numbers** Formula mass, finding the correct formula	12	**2.3 Momentum** Forces acting on an object produces a change in momentum	12
Spring term	**2.3 Energy diagrams** Energy diagrams, energy loss, maintaining temperature	13	**2.3 Nothing gained, nothing lost** Balanced chemical equations, industrial chemical reactions	13	**2.4 Collisions** Momentum is conserved in collisions, calculating velocity, mass or momentum of objects in collisions	13
	2.4 Food production Fish farming, wasted energy in the food chain	14	**2.4 Particles in the real world** Moles of solids, liquids and gases	14	**2.5 Explosive forces** Relationship between change in momentum and force and the time the force acts	14
	2.5 Food factories Free range, battery farming, reduce energy loss	15	**2.5 The most for your money** Products, yield, theoretical yield	15	**2.6 Safety at speed** Designing safety features for cars	15
	2.6 Removal of waste Waste, microbes, nutrients, fertiliser, compost	16	**2.6 Reactions that don't go all the way** Reactants, products, open systems, closed systems	16	***Section 3 Electric charge - intro***	16
	2.7 The carbon cycle carbon cycle, respiration, microbes, decay	17	**2.7 Haber's breakthrough feeds millions** Nitrogen for fertilisers, catalysts, Haber process	17	**3.1 Attraction and repulsion** Potential difference and sparks	17
	2.8 Food at any price? Veal controversy, distance food travels	18	**2.8 Prosperity without pollution?** Sustainable development, atom economies	18	**3.2 Using static electricity** Smoke precipitator, spray painting and photocopiers	18

	Section 3 Enzymes and homeostasis – intro	19	***Section 3 The tortoise and the hare… - intro***	19	**3.3 Electrons on the move** Electric current, current and charge	19
	3.1 Properties of enzymes Catalysts, protein molecules, amino acids, chains, destroyed by temperature	20	**3.1 Putting the heat on** Kinetic energy and chemical reactions, activation energy	20	**Section 4 Using electricity – intro**	20
	3.2 Digestion Digestive enzymes; proteases, amylases, lipases, pH control	21	**3.2 Where reactions happen** Surface area and reactions	21	**4.1 Resistance** Relationship between resistance, current and p.d.	21
	3.3 Investigating digestion Lipases enzymes, conditions needed	22	**3.3 Opportunities for interaction** Solutions, concentration and reactions	22	**4.2 Resistors in series and parallel** Difference in current and p.d in resistors in series and parallel	22
Summer term	**3.4 Industrial uses of enzymes** Enzymes used in production of baby foods, sugar syrups and sweeteners	23	**3.4 Catalysts: substances that speed things up** Catalysts and reactions, finding the right catalyst	23	**4.3 More volts, more amps** Relationship between current, and voltage through a resistor and filament lamp	23
	3.5 Enzymes in the home Biological detergents; how they work	24	**3.5 Catalysts in industry** Expense and profitability, fuel cells, enzymes	24	**4.4 Controlling electricity** Resistance of a thermistor, and a light dependent resistor, diodes	24
	3.6 Respiration Aerobic respiration in animals and plants	25	***Section 4 The energy bank - intro***	25	**4.5 Mains electricity** A.c. supply, mains voltage and frequency	25
	3.7 Homeostasis Carbon dioxide waste, controlled internal conditions	26	**4.1 Reactions with energy to spare** Exothermic reactions, combustion	26	**4.6 Wiring up** Wiring a plug, safety features of plugs and fuses	26
	3.8 Controlling body temperature Maintaining body temperature:	27	**4.2 Invest energy in the products you want** Endothermic reactions,	27	**4.7 Electrical power** Energy transferred, voltage, power and the normal	27

	thermoregulation		photosynthesis, electrolysis		operating current of a device	
	3.9 Controlling body sugar Glucose, insulin, diabetes	28	**4.3 Chemical feedback** Reversible reactions	28	**4.8 Staying safe** Dangers of main electricity	28
	3.10 Treating diabetes Living with and controlling diabetes	29	**4.4 A closer look at the Haber process** Haber process, pressure effect	29	***Section 5 Radioactivity - intro***	29
	Section 4 Inheriting disease – intro	30	**4.5 Waste not, want not** Chemical industry, pollution, sustainability	30	**5.1 Inside the atom** Different models of the atom, plum pudding and nuclear	30
	4.1 The code for life DNA, code, fingerprinting	31	***Section 5 Separating ions for materials - intro***	31	**5.2 Atoms, elements, isotopes** Protons, neutrons, and electrons, and isotopes	31
	4.2 Passing on chromosomes Mitosis, chromosomes, gametes, asexual reproduction	32	**5.1 The current way of harvesting atoms** Electrolysis	32	**5.3 Explaining radioactive decay** Alpha and beta particles, uranium decay	32
	4.3 Predicting and explaining inheritance Dominant and recessive alleles, genetic diagrams	33	**5.2 Liquids hold ions ready for use** Electrolysis: salt brines and copper sulfate	33	**5.4 Nuclear fission** Use in nuclear poser stations and atom bombs, chain reaction	33
	4.4 Harmful genes Genetic diagrams, Cystic fibrosis, Huntington's disease	34	**5.3 Making the salts we need** Uses of salts, making salts, precipitates	34	**5.5 Nuclear fusion** Hydrogen bombs and stars	34
	4.5 Mendel's work Separately inherited factors, Mendel's discovery	35	**5.4 Other ways to make salts** Acids, alkalis and bases	35		
	4.6 Stem cells Stem cells, treatment, social and ethical issues	36	**5.5 Ammonia and the fertiliser debate** Feeding the world and negative effects	36		

Lesson plan B1a 1.1 – Keeping a balance

Student Book pages 4–5	**AQA Science specification, reference 11.1** How do human bodies respond to changes inside them and to their environment? • To evaluate the claims of manufacturer's about sports drinks. • Internal conditions which are controlled include: - the water content of the body - the ion content of the body - temperature - blood sugar levels

Sharing learning objectives	**Learning outcomes**
• You will learn that it is important to control the internal conditions of the body. • You will learn about the control of water content, ion content, blood sugar levels and temperature.	**Students should be able to:** • Describe how to take temperature using a digital thermometer. • Calculate percentage change in temperature. • Describe the control of water content, ion content, blood sugar levels and temperature.

Suggested starter activities	**Teacher notes**
1 Review concept map produced during lesson **B1a1 Body control systems and health**.	**1** This will help prepare them for starter activities 2 and 3.
2 Class discussion on why it is important to control the internal conditions of the body.	**2** Use the book text and/or interactive activities to stimulate this discussion if needed.
3 For each internal body condition listed the students need to identify a reason why the condition needs to be controlled.	**3** Internal conditions which are controlled include: the water content of the body, the ion content of the body, temperature and blood sugar levels.
4 A simple practical to show how to use a digital thermometer to take a person's temperature.	**4** This will give the opportunity for all students to know what the normal body temperature is and how one type of thermometer can be used to take the temperature of the human body.

Main activity	**Teacher notes**

1 **B1a1.1 Temperature and exercise.** (Practical) Looks at the effect of exercise on body temperature. Students make observations about their breathing rate, amount of sweating and how they felt in general. A comprehension exercise is also included (question 7) that looks at the effects of hyperthermia. (Teacher and Student sheets). Extension activities are suggested in the Teacher notes.	**1** Ensure that only students fit enough to undertake the activity do so. A tape recording of the step pace could be used to set the pace so that most students can take part. A stethograph could be used to record breathing rate. If datalogging equipment is available, it could be used to measure temperature.
Interactive activities	**Teacher notes**
1 **B1a1.1b Homeostasis** The first screen is presentation to demonstrate how the human body reacts to changes in temperature. This is a followed by a game in which students have to maintain body temperature. A flowchart presentation then explains how homeostasis works.	**1** This activity can be used for students to gain a better understanding of how the body reacts to changes in temperature.
2 **B1a1.1b Hormones** An interactive flowchart which examines the regulation of glucose levels in the blood.	**2** Students can take turns completing the negative feedback loop to show understanding of how insulin and glucose.
Suggested plenary activities	**Teacher notes**
1 Draw together findings from the practical activity.	**1** Students should appreciate that body responses that they are monitoring may result from internal and/or environmental changes to which the body is responding.
2 Add new detail to the concept map if necessary.	**2** Review the concept map/s to see if there are any aspects of homeostasis of which they are now aware that were not represented in the concept map/s.
3 Students attempt questions on exercise and temperature in student book.	**3** Use differentiated questions as specified in books.

Assessment	**Key skills:** N1.3, N2.3, C1.1, C2.1a **How science works:** 10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7 **Spiritual, Moral, Ethical, Social, Cultural and Other Issues:** 15.4	**Key words** enzyme **[F]**, ion **[H]**	**Extra resources** Homework sheet B1a1.1 **[F] [H]**

Lesson plan C1a 1.1 – What are materials made of?

Student Book pages 84–85	**AQA Science specification, reference 12.1** • Atoms of each element are represented by a chemical symbol, e.g. O represents an atom of oxygen, Na represents an atom of sodium. • Atoms have a small central nucleus around which there are electrons. • When elements react, their atoms join with other atoms to form compounds. This involves giving, taking or sharing electrons and the atoms are held together by chemical bonds. • Atoms and symbols are used to represent and explain what is happening to the substances in chemical reactions. • The formula of a compound shows the number and type of atoms that are joined together to make the compound.

Sharing learning objectives	**Learning outcomes**
• You will learn that atoms have a small nucleus, around which are electrons. • You will learn that atoms and symbols are used to represent and explain what is happening in chemical reactions. • You will learn that elements form compounds by giving and taking electrons or by sharing electrons to form chemical bonds.	**Students should be able to:** • Describe the structure of the atom. • Explain generally atoms can form compounds.

Suggested starter activities	**Teacher notes**
1 Introduce Democritus, Dalton and Bohr's model of the atom.	**1** Dalton resurrected Democritus' idea of the tiny indestructible 'sphere of infinite elasticity'. He even sketched the possible structures of some compounds. By the time of Bohr, scientists like Rutherford, Thompson and Lewis had refined Dalton's ideas incorporating the electron, the nucleus and the movement of electrons into the model of the atom. Bohr suggested the electrons were in different orbits. The debate between the three scientists should contrast the refinements to the model of the atom. These refinements explain what is happening to the atoms when they react.
2 Show pictures of these scientists (these can be found in text books or on the Internet).	**2** This resource is a suggestion and is not provided here.
3 Show a short video about the history of the changes in our model of the atom.	**3** There are many available that will show the different models. This resource is a suggestion and is not provided here.
Main activity	**Teacher notes**

1 **C1a 1.1 Abdera, Dalton and Bohr** (Discussion) Students take roles of Democritus, John Dalton and Nils Bohr discussing these scientists view of the atom. (Student sheet)		**1** Foundation students could focus on the nature of the atoms and arrangements of the protons and electrons in Bohr's model. Higher students could also include thoughts about why the atoms stick together and explain what is meant by a chemical bond in this context. The spec doesn't specify Bohr's model but this is useful background to the lesson.	
2 The students can build a model atom. The model should show the nucleus and the position of the electrons orbiting the nucleus.		**2** The students can use a simplified version of Bohr's model to help them. Ask one or two of the students to explain there model to the others.	
Interactive activities		**Teacher notes**	
1 **C1a 1.1a A bonding experience** This series of animations will help students to understand that when elements react their atoms join with other atoms to form compounds.		**1** Students should have already been taught atomic structure, the definitions of 'element' and 'compound' and they should know the symbols and formulae for the substances used in this activity (calcium oxide, carbon dioxide, sodium chloride and water).	
Suggested plenary activity		**Teacher notes**	
1 Students should write down one question about the nature of the atom, sharing of electrons in compounds or balanced equations. They should be able to give the answer to this question.		**1** Various students could ask their questions and others in the class try to answer them to consolidate the lesson.	
Assessment	**Key skills:** C1.1, C1.2, C2.1a, C2.1b **How science works:** 10.1, 10.2, 10.3	**Key words** atom **[F]**, chemical bond, electron, lattice, nucleus	**Extra resources** Homework sheet C1a1.1 **[F] [H]**

Lesson plan P1a 1.1 – Moving thermal energy

Student Book pages 164–165	**AQA Science specification reference 13.1** • The transfer of energy by conduction and convection involves particles and how this transfer takes place. • Under similar conditions different materials transfer heat at different rates.

Sharing learning objectives	**Learning outcomes**
• You will learn how heat energy can be transferred. • You will learn the difference between these two methods of heat transfer. • You will learn that some things are better conductors than others.	**Students should be able to:** • Identify situations where heat is transferred by both conduction and convection and differentiate between the two methods. • Recognise the fact that not all things conduct equally well. • Explain that convection cannot take place in a solid.
Suggested starter activities	**Teacher notes**
1 Discuss ways in which a pen can be transferred from the teacher to the back of the class. Look for suggestions like: take it to the student (or get him/her to come and collect it); pass it to the student along a chain of other students; throw it across the room to the student. Explain how these two methods (passing it and carrying it) simulate the way heat energy is moved by conduction and convection.	**1** Make sure that students really understand that the two methods of moving the pen (carrying it and passing it) are different. Some other suggestions – roll it along the floor; put it in remote controlled buggy and so on. – are only variations on one or other of these methods.
2 Use the 'pupil model' to explain conduction.	**2** Line about six students up shoulder to shoulder. Get them to link arms and pull themselves tightly together – they represent the particles in a solid. Shake the end student gently – notice how the energy is transferred along the line. Repeat this with the students close together but not in contact (liquid) and with them apart (gas).
3 If the apparatus is available, demonstrate the conduction of heat through different materials as outlined in the Higher textbook (p 164).	**3** Alternatively students can be given the information from the Higher book (p 165) and asked to comment on it. The key idea is that some materials conduct heat better than others.

Main activity	Teacher notes
1 **P1a1.1 How does heat 'move' through a liquid?** (Practical) Examines how hot water circulates as it is heated. (Teacher and Student sheets)	**1** Higher students should attempt the extension activities.
Interactive activities	
1 **P1a 1.1 Moving thermal energy** This activity includes presentations to explain conduction and convection followed by a slideshow and interactive animation.	**1** This activity relates conduction and convection to heating and cooking in the home.
Suggested plenary activities	
1 Students can be encouraged to try to devise a method of remembering which method of energy movement is conduction and which is convection.	**1** A possible method is 'In con**V**ection the particles mo**V**e. In con**D**uction they just **D**ance about.'
2 Give students some examples and ask them if the method of heat transfer is convection or conduction.	**2** Examples can include: the hot water system in a house (convection); smoke rising from a bonfire (particles carried by convection currents in the air); the handle of a saucepan getting hot (conduction); heating water in a saucepan (conduction through the base of the saucepan, convection in the water).
3 Students can also be asked to explain why the walls of houses are filled with foam blocks or why oven gloves stop you burning yourself.	

Assessment	**Key skills:** C1.1, WO1.1, WO1.2, PS1.1, PS1.2, PS1.3 **How science works:** 10.3, 10.4, 10.5, 10.6, 10.7 **Spiritual, Moral, Ethical, Social, Cultural and Other Issues:**	**Key words**	**Extra resources**
PSA opportunity Checking how carefully the potassium manganate (VII) crystal is placed in position and how carefully the water is heated.		conduction **[H]**, conductors **[F]**, convection, convection current **[F]**, insulators	Homework sheet P1a1.1 **[F] [H]**

The online resources

The AQA Science Uncovered: GCSE Science Online software is very easy to navigate and includes everything you could possibly need to make success easier and more fun for your students – and planning and teaching easier for you. The online software includes interactive teaching activities and teacher resource sheets. The latter material is available as Word files, in a form that can easily be adapted to meet the needs of individuals or groups of students.

The opening screen of the online package has live news updates from NewScientist.com. Once you select a particular module you will also see links to specially selected articles from New Scientist which have been chosen by our author team to match parts of the specification you will be teaching.

A media bank of all the artwork from the student books is included in the product, as well as a selection of photographs to match the specification. You can use this resource online in the classroom or lab but, if you prefer, the software also includes a facility to create your own lessons by selecting the '**My lessons**' option and choosing different activities and assets to store in any order you wish. You can save this to your own PC or network, but please note that you will have to revisit the online site to resave the stored lesson after three months.

Using an **administrator password** allows you to set up student as well as teacher log ins, so that students can use this resource at home or at school. The student view does not include access to lesson plans, answer sheets (homework, self-assessment, and student book) and teacher and technician notes.

Teacher resource Word sheets

Lesson plans

To assist schools in producing personalised schemes of work based on the AQA specification, lesson plans are provided which summarise all the teaching required to meet the specification with learning objectives and outcomes, ideas for starter and plenary activities and main activities.

Starters and plenaries

Each lesson plan has suggested starter and plenary ideas with accompanying teacher notes. Starter activities can be of several types: problem solving (e.g. a short demonstration followed by questions), a quick and easy practical; capture interest (showing a piece of video or animation); brainstorming following a demonstration or a video; or a word game. The idea is to stimulate the students and get them to engage with what they are about to learn. Plenary activities are a maximum of 15 minutes long and can be: sharing feedback from an activity, in groups or in pairs, a poster session, word games. Plenaries are an opportunity for assessment for learning, allowing students to understand how much they know and how much they still have to learn/do.

Learning objectives and outcomes

These are given for both higher and foundation levels. The outcomes are designed to be measurable and to link to the student book and the activities the students will have completed.

Teacher notes

The Teacher notes column includes ways of addressing the content being taught for different leaner styles, giving examples of how the activities can be adapted for higher and foundation students or gifted and talented or any advise on extra help that should be given for learner support.

Main activity sheets

There are over 120 activities suitable for students. Some of them are intended to help you develop investigative skills in your students before Assessment. Others are intended to help you develop your students' ideas about **how science works**. These include, discussions, role play and research and ICT activities. Most activity sheets include questions for students to answer. Questions for higher level students are indicated on the sheets.

Links to the interactive activities on the online product are also included for completeness.

Teacher and technician sheets

Most student activity sheets have accompanying Teacher and technician notes. These provide guidance for using the activities by indicating the aim of the activity and suggesting ways in which the sheets may be customised for lower level students. They also flag the expected outcomes and provide answers to the questions posed on the activity sheets. A complete list of equipment needed to run the activity is included, as well as safety notes to aid with COSHH assessment.

Exemplar ISAs

Exemplar ISAs are included so that you can give your students practice in answering the types of questions they will meet in their internal assessment. The ISAs are divided into three sections: investigation, the process and displaying of data and the written paper.

Self-assessment quizzes

The Heinemann AQA Science Uncovered textbooks provide a range of in-text and end of unit questions. To complement this, self-assessment question and answer sheets are provided as part of the online resources. Self-assessment is non-threatening and students can use it themselves when there is a suitable time, e.g. before taking an end-of-unit test or when a piece of practical work is finished. Self-assessment is provided at both Foundation and Higher levels. Using this Self-assessment may also highlight student' weaknesses.

Homework sheets

These provide an opportunity for students to work alone on activities focussed on reinforcing and applying the knowledge they have gained The homework sheets are given at both higher and foundation levels for personalised learning and answers are also provided.

Student checklists

The Student checklists expand the AQA specification and simplify the language for students. Students could be given a copy of the Student checklist at the start of the Teaching module. They then tick off the statements as they cover them in column A. When they are fully confident that they can answer questions on the statement, they tick column C. This provides the basis for their revision planning. It is hoped that using these will help students organise really good individual revision plans.

Answers to questions

This online resource includes answers to all the questions in the Science Uncovered: GCSE Science student books. Teachers can use these to mark answers or copy the relevant parts and give them to students. This can be useful if students have missed work because of absence.

Interactive teaching and learning activities

The interactive teaching and learning activities support the teaching of the new specifications. They are designed to be interactive, stimulate discussion and be collaborative. Some are based on a game format, most give feedback both audio and visual. Also, most can be used either as a whole-class teaching tool or for individual (or in pairs) student work.

The activity numbers link directly to the student book and the sections within the AQA specification. To view activities for a particular lesson, first select biology, chemistry or physics, then the unit and then the lesson. The available activities, together with the relevant activity notes, are listed in the left hand column on the screen.

Each activity can be made up of one or more screens – the screen number is shown at the bottom of the screen. Activity notes accompany each set of activities and explain the learning objective(s) and how the activity can be used and how it can be adapted for different learning styles.

Some activities in physics and chemistry are based on the powerful **Crocodile Clips** simulations, which have already been set up for the teacher and student. All you, or the student, need to do is run the simulation and change the variables to see the effect.

Using the comprehensive assessment for learning

Heinemann AQA Science Uncovered provides many resources to help you to track the progress of your students.

What you need to know

Each student will start their learning at a different point depending on their individual knowledge and experience. The major feature of assessment for learning is that students recognise what they know, what they aren't sure about and where there are gaps in their knowledge.

In the student books, each double page spread has a key points box which tells the student what they have learnt. You can ask students questions based on these points to see what they have remembered.

In-text questions

These are in the student books and help you and your students check their understanding as they progress through the lesson.

Student checklists

These can be used throughout the unit and at the end to help students check their strengths and weaknesses.

Keywords

Keywords are in bold on each page and can be used throughout the module and students tested at the end on their understanding of these key terms.

Self-assessment quizzes

Students can use the self-assessment quizzes to check on progress and can also use the answer sheets to mark themselves or a partner, offering the opportunity for assessment for learning.

End of unit questions

These are provided with mark schemes to give you and your students feedback on how well they might do in the AQA examinations.